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10/079,923	02/20/2002	Victor Firoiu	2204/C23	6488

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EXAMINER	
ADHAMI, MOHAMMAD SAJID	

ART UNIT	PAPER NUMBER
2616	

DATE MAILED: 06/27/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/079,923	FIROIU ET AL.	
	Examiner	Art Unit	
	Mohammad S. Adhami	2616	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *13 April 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-3 and 5-28* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-3,5-8,10-23, and 25-28* is/are rejected.

7)☒ Claim(s) *9 and 24* is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

- Applicant's amendment filed 4/13/2006 is acknowledged.
- Claims 4 and 29-43 have been cancelled.
- Claims 1-3 and 5-28 are pending.
- Examiner has noted that on pg.9 of the remarks, Applicant shows Claims 29-43 as being cancelled and claims 1-28 as pending. However, submitted claims show claim 4 as cancelled, so claims 4 and 29-43 are cancelled and claims 1-3 and 5-28 are pending.

Claim Objections

1. Claim 5 is objected to because of the following informalities: On pg.2 claim 5, "queue drop capability" should be "queue drop probability". Appropriate correction is required.

Claim Rejections - 35 USC § 103

2. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

3. Claims 1,2,6-8,10,11,14,15,17-19,21-23,25 and 26 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gracon (US App. 2002/0110134).

Re claim 1:

Gracon discloses *determining a level of congestion at an output queue of a network device* (Paragraph [0045] "The RED process calculates the average queue size" where the level of congestion is based on the queue size (Q_avg)).

Gracon further discloses *determining an ingress queue drop probability for an ingress queue that is associated with an ingress port of the network device* (Paragraph [0045] "If the Q_avg is somewhere between MinTh and MaxTh, a packet drop probability (Pb) is calculated" where Q_avg is used for "the level of congestion at the output queue").

Gracon further discloses *dropping packets at the ingress port of the network device according to the ingress drop probability to reduce congestion at the output queue* (Paragraph [0045] "A packet is randomly dropped based on the calculated Pb" where dropping the packets will reduce congestion).

Gracon does not explicitly disclose *the ingress queue probability being based upon the level of congestion at the output queue.*

Barri discloses *the ingress queue probability being based upon the level of congestion at the output queue* (Col.7 lines 26-27, A Per Flow Background Update, as shown in Figure 2 reference number 114, "periodically...calculates drop probabilities" and Col.6 lines 15-16 the ingress system receives several congestion indicators as input, where congestion information about the output queue is sent from the output queue to the input queue as shown in Figure 2 by the link between the ingress logic and egress logic).

Gracon and Barri are analogous because they both pertain to congestion management.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Gracon to use congestion information from the output queue in the input queue as taught by Barri in order to more efficiently control congestion problems.

Re claim 14:

Gracon discloses *egress logic operably coupled to maintain an output queue of a network device and to determine a level of congestion at an output queue* (Figure 1 reference 122, where the packet scheduler has a congestion manager as shown in Figure 2 reference 204 that maintains an output queue).

Gracon further discloses *ingress logic operably coupled to control the rate at which information is forwarded to an output queue using an ingress forwarding scheme that is based upon the level of congestion at a queue* (Figure 1 reference 106 and Paragraph [0022] "The packet scheduler...sends instructions to the packet manager...to either drop a packet, due to policing or congestion, or send a packet according to a schedule" where the "rate at which information is forwarded" is dependent on how many packets are dropped and the "ingress forwarding scheme" is the probability of dropping a packet, all of which occur in the packet scheduler).

Gracon further discloses *an ingress queue* (Fig.1 ref.106 where the packet scheduler has a congestion manager as shown in Fig.2 ref. 204 that maintains an ingress queue).

Gracon does not explicitly disclose *ingress logic controlling the rate at which information is forwarded to the output queue or controlling an ingress queue drop rate based upon the level of congestion at the output queue.*

Barri discloses *ingress logic controlling the rate at which information is forwarded to the output queue or controlling an ingress queue drop rate based upon the level of congestion at the output queue* (Col.7 lines 26-27, A Per Flow Background Update, as shown in Figure 2 reference number 114, "periodically...calculates drop probabilities" and Col.6 lines 15-16 the ingress system receives several congestion indicators as input, where congestion information about the output queue is sent from the output queue to the input queue as shown in Figure 2 by the link between the ingress logic and egress logic).

Gracon and Barri are analogous because they both pertain to congestion management.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Gracon to use congestion information from the output queue in the input queue as taught by Barri in order to more efficiently control congestion problems.

Re claim 19:

Gracon discloses *the ingress logic being operably coupled to drop information at an ingress queue when the information is destined for the output queue, where the information is dropped at an ingress drop probability that is determined based upon the level of congestion at the output queue* (Paragraph [0045] "A packet is randomly dropped based on the calculated Pb" where it has been established above that Pb is based on the "level of congestion").

Re claims 2 and 15:

Gracon discloses *collecting congestion information for the output queue* and *computing a running time average of the output queue size* (Paragraph [0045] "The RED process calculates the average queue size" where the level of congestion is based on the queue size (Q_avg) where the queue size is "congestion information").

Gracon further discloses *deriving a drop probability for the output queue based upon the running time average of the output queue size* (Paragraph [0045] "The Pb is a function of...the difference between the Q_avg and the MinTh" where Pb is the "drop probability" and Q_avg is the "running time average of the output queue size").

Re claims 6 and 21:

Gracon discloses *maintaining a step number for the output queue, the step number indicating an ingress drop probability level having a corresponding ingress drop probability* (Paragraph [0047] "five congestion regions are separated

by four programmable levels...Each level represents a predetermined queue size" where the levels are "step numbers" and it has previously been established that queue size determines the "ingress drop probability").

Gracon further discloses *initializing the step number for the output queue to a predetermined initial step number* (Paragraph [0047] "all packets received when the NQ size is less than the Pass_level are passed" where NQ size is the instantaneous queue size and "the step number" is initialized to Pass_level because at initialization the queue size is zero).

Gracon further discloses *setting the ingress drop probability for the input queue equal to an ingress drop probability corresponding to the initial step number* (Paragraph [0047] "all packets received when the NQ size is less than the Pass_level are passed" where the "ingress drop probability" corresponding to the Pass_level is zero).

Gracon further discloses *monitoring changes in the level of congestion at the output queue* (Changes in the level of congestion will be monitored because an instantaneous queue size is used, see Paragraph [0046] "instantaneous queues size (NQ_size)").

Gracon further discloses *incrementing the step number for the output queue and setting the ingress drop probability for the input queue equal to an ingress drop probability corresponding to the incremented step number, if the level of congestion at the output queue is greater than a first predetermined threshold* (Paragraph [0047] "five congestion regions are separated by four

programmable levels...Each level represents a predetermined queue size" where the levels are "step numbers" so as the queue size increases, the step number increases and Paragraph [0048] "If the NQ_size is greater than the Pass_level, a probability of dropping a red packet (P_red) is determined" where red is the next "step number" and the Pass_level is the "first predetermined threshold").

Gracon further discloses *decrementing the step number for the output queue and setting the ingress drop probability for the input queue equal to an ingress drop probability corresponding to the decremented step number, if the level of congestion at the output queue is less than a second predetermined threshold* (Because the step number is based on the queue size, when the queue decreases, it will automatically drop the step number to one that corresponds to the new queue size).

Re claims 7 and 22:

Gracon discloses *maintaining the step number for the output queue at an ingress port* (The step number is determined at the congestion manager (reference 204 of Figure 2) which is located in packet scheduler 106 of Figure 1 at the "ingress port", so the step number is maintained there.).

Re claims 8 and 23:

Gracon discloses *maintaining the step number for the output queue at the output queue* (The step number is determined at the congestion manager (reference 204 of Figure 2) which is located in packet scheduler 122 of Figure 1 at the "output queue", so the step number is maintained there.).

Re claims 10 and 25:

Gracon discloses *determining that the level of congestion at the output queue has increased; and increasing the ingress queue drop probability* (Paragraph [0045] "The Pb is a function of...the difference between Q_avg and the MinTh" where Pb is the "ingress drop probability" Q_avg is the average queue size, which determines the level of congestion, and Figure 5 where the "level of congestion" is shown to have a linear relationship with "the ingress drop probability". At T1, the "level of congestion is low" so the drop probability is 0, but at T5 the "level of congestion" is high" so the drop probability is 1).

Re claims 11 and 26:

Gracon discloses *determining that the level of congestion at the output queue has decreased; and decreasing the ingress queue drop probability* (Paragraph [0045] "The Pb is a function of...the difference between Q_avg and the MinTh" where Pb is the "ingress drop probability" Q_avg is the average queue size, which determines the level of congestion, and Figure 5 where the "level of congestion" is shown to have a linear relationship with "the ingress drop probability". At T1, the "level of congestion is low" so the drop probability is 0, but at T5 the "level of congestion" is high" so the drop probability is 1).

Re claim 17:

As discussed above, Gracon meets all the limitations of the parent claim.

Gracon does not explicitly disclose *the ingress logic being operably coupled to determine the ingress forwarding scheme based upon output queue congestion information provided by the egress logic.*

Barri discloses *the ingress logic being operably coupled to determine the ingress forwarding scheme based upon output queue congestion information provided by the egress logic* (A Per Flow Background Update, as shown in Figure 2 reference number 114, "periodically...calculates drop probabilities" (Col.7 lines 26 and 27) for the output queue, where dropping packets with a drop probability is an "ingress forwarding scheme" and where congestion information about the output queue is sent from the "egress logic" to the "ingress logic" as shown in Figure 2 by the link between the ingress logic and egress logic).

Gracon and Barri are analogous because they both pertain to congestion management.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Gracon as discussed above as taught by Barri in order to more efficiently control traffic flow.

Re claim 18:

As discussed above, Gracon meets all the limitations of the parent claim.

Gracon does not explicitly disclose *the egress logic being operably coupled to determine the ingress forwarding scheme and provide the ingress forwarding scheme to the ingress logic.*

Barri discloses *the egress logic being operably coupled to determine the ingress forwarding scheme and provide the ingress forwarding scheme to the ingress logic* (Col.5 lines 22-26 "The basic logical tasks of the egress system 106 comprise...calculation of transmit probabilities" and Col.6 lines 15-18 "the ingress system 102 receives several congestion indicators as input. Based on these congestion indicators, based on programmable probabilities" and Figure 2 where a link that "provides the ingress forwarding scheme to the ingress logic" is shown between reference numbers 106 and 102).

Gracon and Barri are analogous because they both pertain to congestion management.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Gracon as discussed above as taught by Barri in order to more efficiently control congestion problems.

4. Claims 3 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gracon in view of Barri as applied to claims 1 and 14 above, and further in view of Cloonan (US App. 2002/0009051).

Re claims 3 and 16:

As discussed above, Gracon meets the limitations of the parent claim.

Gracon does not explicitly disclose *monitoring an input data rate to the output queue; and monitoring an output data rate from the output queue*.

Cloonan discloses *monitoring an input data rate to the output queue; and monitoring an output data rate from the output queue* (Paragraph [0028] "The

data throughput monitor (220) has the task of determining the rate of data packet flow" and Figure 2 references 220 and 225 where there is a monitor for the input and output).

Gracon, Barri, and Cloonan are analogous because they all pertain to transmitting data packets.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Gracon as discussed above as taught by Cloonan in order to accurately measure traffic flow and congestion of the output queue.

1. Claims 5,12,13, 20,27 and 28 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gracon in view of Barri as applied to claim 1 above, and further in view of Bonneau (US 6,671,258).

Re claims 5,12, and 13:

As discussed above, Gracon meets all the limitations of the parent claim.

Gracon does not explicitly disclose "determining a forwarding rate for forwarding information to the output queue based upon the level of congestion at the output queue" and "determining that the level of congestion at the output queue has increased; and decreasing the forwarding rate" and "determining that the level of congestion at the output queue has decreased; and increasing the forwarding rate."

Bonneau (**Re claim 5**) discloses "determining a forwarding rate for forwarding information to the output queue based upon the level of congestion at

the output queue" (Col.2 lines 30-32 "TCP is an adaptive flow because the packet transmission rate for any given flow depends on its congestion").

Bonneau further (**Re claim 12**) discloses "determining that the level of congestion at the output queue has increased; and decreasing the forwarding rate" and (**Re claim 13**) "determining that the level of congestion at the output queue has decreased; and increasing the forwarding rate" (As shown above, the transmission rate is adaptive and depends on the congestion, so if congestion increases the flow rate will decrease and if congestion decreases the flow rate will increase. The Abstract shows this relationship with "TCP flows which decrease their transmission rates in response to congestion").

Gracon and Bonneau are analogous because they both pertain to queuing data packets.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Gracon as discussed above as taught by Bonneau in order to prevent overflow and packet loss.

Re claims 20,27 and 28:

As discussed above, Gracon meets all the limitations of the parent claim.

Gracon does not explicitly disclose "determining a forwarding rate for forwarding information to the output queue based upon the level of congestion at the output queue" and "determining that the level of congestion at the output queue has increased; and decreasing the forwarding rate" and "determining that

the level of congestion at the output queue has decreased; and increasing the forwarding rate."

Bonneau (**Re claim 20**) discloses "determining a forwarding rate for forwarding information to the output queue based upon the level of congestion at the output queue" (Col.2 lines 30-32 "TCP is an adaptive flow because the packet transmission rate for any given flow depends on its congestion").

Bonneau further (**Re claim 27**) discloses "determining that the level of congestion at the output queue has increased; and decreasing the forwarding rate" and (**Re claim 28**) "determining that the level of congestion at the output queue has decreased; and increasing the forwarding rate" (As shown above, the transmission rate is adaptive and depends on the congestion, so if congestion increases the flow rate will decrease and if congestion decreases the flow rate will increase. The Abstract shows this relationship with "TCP flows which decrease their transmission rates in response to congestion").

Gracon, Barri, and Bonneau are analogous because they all pertain to congestion management.

It would have been obvious to one of ordinary skill in the art at the time of the invention to modify Gracon as discussed above as taught by Bonneau in order to prevent overflow and packet loss.

Allowable Subject Matter

2. Claims 9 and 24 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

The prior art of record does not teach or fairly suggest "determining an ingress drop probability for dropping information destined for the output queue based upon the level of congestion at the output queue comprises: determining thresholds T and h; determining a number of ingress drop probability levels n, where: $n = [\log_{(1-T)/(1-h)}(1/N)]$; and determining an ingress drop probability s_n for each ingress drop probability level n, where: $sn = ((1-T)/(1-h))^n$. The prior art of art fails to teach or fairly suggest the formula, $n = [\log_{(1-T)/(1-h)}(1/N)]$, used to determine the ingress drop probability levels and the formula, $sn = ((1-T)/(1-h))^n$, used to determine the ingress drop probability.

Response to Arguments

3. Applicant's arguments with respect to claims 1,2,6-8,10 and 11 have been considered but are moot in view of the new ground(s) of rejection.

The arguments concerning Gracon and Cloonan are moot in view of the new grounds of rejection.

4. Applicant's arguments filed 4/13/2006 have been fully considered but they are not persuasive.

In the remarks on pg.12 of the Amendment, Applicant contends the structure of Bonneau is fundamentally different from the claimed invention.

However, the Applicant does not indicate what claim limitations are not met.

In the remarks on pg.12 of the Amendment, Applicant contends that Barri neither describes nor suggests calculating input queue drop probability based on output queue congestion as claimed.

The Examiner respectfully disagrees. As cited in the office action, Barri discloses calculating input queue drop probability based on output queue congestion (Col.7 lines 26-27, A Per Flow Background Update, as shown in Figure 2 reference number 114, "periodically...calculates drop probabilities" and Col.6 lines 15-16 the ingress system receives several congestion indicators as input, where congestion information about the output queue is sent from the output queue to the input queue as shown in Figure 2 by the link between the ingress logic and egress logic). The cited passages and figure of Barri indicate that output queue congestion information is sent to the ingress system, where it can be used to calculate drop probabilities.

In the remarks on pg.12 of the Amendment, Applicant contends that the combination of Gracon, Bonneau, Barri, and Cloonan do not describer or suggest *dropping packets at the ingress port of the network device according to the*

ingress drop probability to reduce congestion at the output queue or *the ingress logic being coupled to an ingress queue of the network device for controlling an ingress queue drop rate based upon the level of congestion at the output queue.*

The Examiner respectfully disagrees. As shown above, Barri discloses calculating an input queue drop probability based on output queue congestion. Gracon shows using the drop probability to drop packets at the input queue and controlling an ingress queue drop rate.

Gracon is cited in the above office action as disclosing *dropping packets at the ingress port of the network device according to the ingress drop probability to reduce congestion at the output queue* (Paragraph [0045] "A packet is randomly dropped based on the calculated Pb" where dropping the packets will reduce congestion).

Gracon further discloses *an ingress queue* (Fig.1 ref.106 where the packet scheduler has a congestion manager as shown in Fig.2 ref. 204 that maintains an ingress queue).

Furthermore, the ingress queue drop rate in controlled based on the drop probability, which is based upon the level of congestion. If there is more congestion, then more packets are dropped.

Conclusion

5. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP

§ 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Mohammad S. Adhami whose telephone number is (571)272-8615. The examiner can normally be reached on Monday-Friday 8-4:30.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Hassan Kizou can be reached on (571)272-3088. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic

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MSA 6/22/2006

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